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An Environmental Challenge of Body Image Disturbance in Bulimia Nervosa.

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An Environmental Challenge of Body Image Disturbance in Bulimia Nervosa

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in

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by
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B.S., University of Pittsburgh, 1983
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Abstract

A theoretical model was proposed to define the construct of body image in terms of body image distortion, drive for thinness, and body size dissatisfaction. The purpose of this study was to investigate the reactivity effects of an environmental challenge on body image disturbance. Thirty-six females participated. Eighteen subjects had been diagnosed with bulimia nervosa and 18 subjects served as controls. Subjects were matched on height and weight and compared on a variety of measures related to body image disturbance before and after being weighed and eating a high-calorie snack. Body image assessment utilized the Body Image Assessment Instrument and the Body Image Testing System. Other measures included the Goldfarb Fear of Fat Scale, two subscales of the Eating Disorder Inventory (Body Dissatisfaction and Drive for Thinness), and subjective ratings of distress (SUDS). The GFFS score was proposed as a covariate to investigate the effects of this variable on the reactivity of body image disturbance. Analysis of covariance was determined to be inappropriate because the assumption of treatment and covariate independence was not met. The covariate was highly correlated with other dependent measures in the bulimic sample but not in the control group. Thus, the effects of the covariate were limited to between group differences. Results showed that bulimia nervosa subjects evidenced more body image disturbance on all measures at pre-assessment indicating that body image disturbance is a stable characteristic. Following the challenge, bulimics reported greater subjective distress and perceived themselves to be larger than at pre-assessment. Ideal body size estimates

were not affected by the challenge. The theoretical model was revised to indicate that environmental events affect body image disturbance via an increase in current body size estimates in bulimic subjects. Control subjects did not show this effect. This study was the first to conceptualize body image disturbance as a multi-factor phenomenon within a theoretical model. Future studies should continue to investigate the reactivity of body image distortion using the BITS as this measure was found to be sensitive to the effects of an environmental challenge.

An Environmental Challenge of Body Image Disturbance in Bulimia Nervosa

Hilde Bruch (1962) first defined body image disturbance in anorexia nervosa as "the absence of concern about emaciation, even when advanced, and the vigor and stubbornness with which the often gruesome appearance is defended as normal and right (p.189)." The construct of body image has been conceptualized and measured from many different perspectives since Bruch's first writing. In fact, a wide range of phenomena, i.e., perceptual, cognitive, and emotional, have been investigated under the rubric of "body image." For example, the construct of body image has been conceptualized as the picture of our own body which we form in our mind (Schilder, 1935), as a neural representation of bodily experience (Head, 1920), as the feelings one has about his body (Secord & Jourard, 1953), and as a personality construct (Kolb, 1975). More recently, Garner and Garfinkel (1981) described body image disturbance as a two-part phenomenon, including a "perceptual" component as well as an affective or cognitive component, often referred to as "body image dissatisfaction." Others have conceptualized body image disturbance as a weight phobia (Crisp, 1970) or an extreme drive for thinness (Williamson, Davis, Duchmann, McKenzie, & Watkins, 1990). Despite these differences in conceptualization, the body image construct appears to be clinically relevant, especially pertaining to anorexia nervosa and bulimia nervosa. The fact that body image is relevant to both eating disorder categories may be inferred from the inclusion of symptoms related to body image in the current edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R, American Psychiatric Association, 1987) for anorexia

nervosa as well as bulimia nervosa. Diagnostic criteria for anorexia nervosa include body image distortion as "claiming to feel fat even when emaciated," drive for thinness as "an intense fear of gaining weight or becoming fat" and body size dissatisfaction as "a refusal to maintain normal body weight (p. 70)." In addition, the diagnostic criteria for bulimia nervosa include "a persistent overconcern with body shape and weight (p. 73)," suggesting that body image disturbance may not be exclusively associated with anorexia nervosa.

Empirical investigation of body image in anorexia nervosa was first reported by Slade and Russell (1973) and since that time, research has expanded to include normal-weight and over-weight individuals as well as bulimia nervosa subjects. A wide variety of measurement systems have been devised to study body image disturbance and several have been shown to be reliable and valid. Although knowledge regarding body image disturbance in anorexia nervosa and bulimia nervosa remains equivocal, a number of consistent trends have been reported.

A review of measurement techniques and available reliability and validity data is presented initially. Controlled investigations are discussed as a function of both type of methodology and specific eating disorder pathology. General construct issues and a new theoretical formulation of body image disturbance are also presented. The existing literature pertaining to the degree to which body image disturbance is affected by environmental challenges is reviewed and an experiment designed to examine this phenomenon is presented.

Measurement of Body Image

Body image disturbance has been measured with a variety of

techniques. The most commonly used approaches have been "distorting image techniques" and "body-part size estimation" methodology. Silhouettes of female figures and a computerized assessment have also been developed in recent years to study body image disturbances. In addition, a variety of attitudinal measures have been used in studies of body image disturbance. Each type of methodology is described and available reliability and validity data are reviewed with a special emphasis on discriminant validity. Construct validity studies are notably lacking and will be discussed in a later section.

Distorting Image Techniques

Distorting image techniques generally require subjects to estimate their overall body size while confronting their own images. An "adjustable body-distorting mirror," which can be bent to provide distorted images of subjects, was the first of these measures to be developed (Traub & Orbach, 1964). The Distorting Photograph Technique (DPT, Glucksman & Hirsch, 1969) consists of a variable, anamorphic lens that is capable of distorting a standard slide photograph of a subject by 20% over or under the original size of the slide. Another distorting image technique is the Video Distortion Technique (VDT, Allebeck, Hallberg, & Espmark, 1976), which involves a modified television camera that electronically distorts the subjects image to be smaller or larger than the actual size. With each of these measurement techniques, subjects are required to adjust the image to match their perceived actual size and often their ideal size. The degree of adjustment is used as a measure of body image distortion.

Temporal stability of distorting image techniques has been

demonstrated in anorexics (r = .91) and controls (r = .83) over one to three weeks (Freeman, Thomas, Solyom, & Hunter, 1984). Garfinkel, Moldofsky, Garner, Stancer, and Coscina (1978) reported a slightly lower estimate in a combined sample of eating disorder groups and controls (r = .75). Stability over one year was reported by Garfinkel, Moldofsky, and Garner (1979) for anorexics (r = .70) and controls (r = .64). Internal consistency has been more difficult to establish as most distorting image techniques produce a single score. By correlating profile and frontal body image scores, Freeman et al (1984) obtained satisfactory internal consistency estimates (r = .62) for the video distortion technique.

With regard to discriminant validity, three controlled studies using distorting image techniques have shown anorexic subjects to overestimate their body size to a greater degree than control subjects (Freeman, Thomas, Solyom, & Miles, 1983; Garfinkel et al., 1978; Wingate & Christie, 1978) although three other controlled studies reported no differences between anorexics' estimates of body size and controls' estimates (Freeman, Thomas, Solyom, & Koopman, 1985; Garfinkel, Moldofsky, & Garner, 1979; Touyz, Beumont, Collins, McCabe, & Jupp, 1984). Bulimic subjects, on the other hand, have been shown to consistently overestimate their body size in two studies using distorting image techniques (Freeman et al., 1985; Touyz, Beumont, Collins, & Cowie, 1985). It is of interest to note that these two studies also compared body size overestimation of anorexics and bulimics, as well as controls. Freeman et al (1985) reported that bulimics with a history of anorexia overestimated body size more than anorexic subjects and bulimics without a history of anorexia. Touyz et

al (1985) found that 95% of bulimics overestimated body size compared to only 48% of anorexics.

Concurrent validity of a modified VDT procedure was investigated by Freeman and his colleagues (Freeman et al.,1984). Body image distortion was found to be moderately correlated (r = .56) with the Eating Attitudes Test (EAT, Garner & Garfinkel, 1979) and body image dissatisfaction (derived by subtracting ideal image from perceived image) was moderately correlated (r = .45) with scores on the Beck Depression Inventory (BDI, Beck, 1967).

Body-Part Size Estimation

The first of these techniques, the "movable caliper technique" or Visual Size Estimation task (VSE), was developed by Reitman and Cleveland (1964) and adapted for use with anorexic populations by Slade and Russell (1973). This system involves two lights which are mounted in tracks on a horizontal bar. A pulley allows for the symmetrical movement of the two lights which are adjusted by the subject to estimate the width or depth of specific body regions. Slade and Russell (1973) introduced an index of body perception accuracy (BPI) which has been widely used. Accuracy of each body region is derived using the formula BPI = perceived size/actual size x 100. Actual size is determined with the use of an anthropometer or body caliper. The BPIs for each body area are often averaged to determine a composite index of body perception accuracy.

Ruff and Barrios (1986) introduced a new size estimation technique known as the Body Image Detection Device (BIDD) which consists of a standard overhead projector which is manipulated to allow a 1 cm-wide horizontal band of light to be projected on the wall. Two poster board

templates, one in the shape of a triangle, and the other with a triangle removed from it, are moved through wooden guides mounted to the top of the projector, allowing for the horizontal width of the band of light to expand or converge. The subject is asked to adjust the band of light to estimate the widths of various body parts. A modification of the BIDD has been introduced more recently (Thompson & Thompson, 1986), that allows for the simultaneous presentation of four horizontal beams of light, so that size estimations of four body regions may be obtained during one trial.

Internal consistency was investigated by Pierloot and Houben (1978). Intercorrelations ranging from .25 for shoulders and face to .73 for hips and waist were reported. Temporal stability has also been demonstrated for the body-part size estimation techniques (Ruff & Barrios, 1986). These authors measured test-retest reliability in a sample of 34 anorexics and controls and reported a range of correlation coefficients from .84 for waist to .92 for hips. With regard to discriminant validity, anorexic subjects have been shown to overestimate body size to a greater degree than controls in three controlled studies (Pierloot & Houben, 1978; Slade, 1977; Slade & Russell, 1973;) although six studies have reported no differences between anorexics and controls (Ben-Tovim & Crisp, 1984; Button, Fransella, & Slade, 1977; Casper, Halmi, Goldberg, Eckert, & Davis, 1979; Crisp & Kalucy, 1974; Norris, 1984; Strober, Goldenberg, Green, & Saxon, 1979). Results of body-part size estimation studies with bulimics have also produced mixed results with two studies reporting greater overestimation of body size by bulimic subjects than controls (Ruff & Barrios, 1986; Willmuth, Leitenberg, Rosen, Fondacaro, & Gross,

1985) and two studies reporting no differences between bulimics and controls (Birtchnell, Lacey, & Harte, 1985; Norris, 1984).

Silhouettes

Gottesman and Caldwell (1966) first developed a series of silhouettes as a measure of body image disturbance. This methodology was modified by Counts and Adams (1985) to individualize the procedure. Each subject was presented with a set of seven silhouettes, one having been drawn from the subject's actual photograph and the remaining silhouettes representing 2.5, 5, and 7.5% increases and decreases in the size of certain body areas of the original figure. Subjects were asked to select both their actual size and their ideal size.

Williamson, Kelley, Davis, Ruggeiro, and Blouin (1985) introduced another type of silhouette methodology for measuring body image disturbances called the Body Image Assessment (BIA) procedure. This method is quite simple in that it involves selection of a silhouette of a female body frame which most closely resembles the subject's perception of their current body size (CBS) and ideal body size (IBS). Norms have been developed which allow for conversion of raw scores to standardized scores and comparison with normals of the same size dimensions of the subject. The BIA is designed to assess perception of current body size as well as preference for a thin body size, measures which are conceptually related to body image distortion, drive for thinness, and body size dissatisfaction.

The BIA has been investigated with regard to both reliability and validity. Test-retest estimates have been investigated with the BIA across one- and two-week intervals. Across both time intervals, estimates

of .90 for CBS and estimates of .71 for IBS were obtained (Williamson, Davis, Goreczny, & McKenzie, 1989).

Discriminant validity studies have shown the BIA to differentiate bulimia nervosa and normal subjects, in that bulimics chose a larger CBS and thinner IBS than same-sized normals (Williamson et al., 1985). Also, this procedure has been shown to differentiate simple bulimia, i.e., binge-eaters, from bulimia nervosa, i.e., binge-purgers (Davis, Williamson, Goreczny, & McKenzie, 1989).

Concurrent validity of the BIA was investigated by correlating the CBS and IBS with known measures of bulimia nervosa and anorexia nervosa, i.e., Bulimia Test (BULIT, Smith & Thelen, 1984) and Eating Attitudes Test (EAT, Garner & Garfinkel, 1979). Current body size and ideal body size were used as criterion variables with the BULIT and EAT as validity measures in a series of canonical correlations. Results indicate that a pattern of high CBS scores and low IBS scores was associated with severe eating disorder problems such as bulimia nervosa. This pattern can be conceptualized as indicative of body image distortion and extreme drive for thinness. The second significant canonical correlation found high scores on the CBS and IBS to be positively correlated with high scores on the BULIT and low scores on the EAT, which is suggestive of an obese binge-eater profile (Williamson et al., 1989). A second concurrent validity study using the Eating Questionnaire (EQ, Williamson, Kelley, Cavell, & Prather, 1987) showed high CBS scores to be primarily associated with large weight gains, uncontrollable binge eating, and frequent dieting. Low IBS scores, on the other hand, were associated with use of self-induced vomiting and laxatives for weight control. Together these

findings suggest that a pattern of high CBS and low IBS scores is indicative of bulimia nervosa, while high CBS scores without low IBS is probably indicative of binge-eating without purging or simple obesity. This conclusion is consistent with the findings of Davis et al (1989) which showed that bulimia nervosa was associated with body image distortion and extreme drive for thinness, resulting in a high degree of body size dissatisfaction. Bulimic binge-eaters who were obese, in contrast, were characterized by a high degree of body size dissatisfaction without problems of body image distortion or drive for thinness.

Computerized Assessment

Schlundt and Bell (1988) have developed a microcomputer program for assessing cognitive and affective components of body image. The Body Image Testing System (BITS) is a TURBO PASCAL program for IBM-PC and compatible systems which uses interactive computer graphics to generate a front view and side view of a human body. Subjects make the image grow smaller or larger for 9 independent body regions (face, neck, shoulders, chest, arms, breasts, stomach, hips, and thighs) by adding or subtracting "pictels" on the computer's screen. Thus, this procedure allows for small adjustments of specific body areas as opposed to adjustments of the entire figure. In addition to being a sensitive measure, subjects may be asked to adjust the figure to their perceived "actual" size, their "ideal" size, or how fat or thin their body "feels." Thus, the BITS is similar to the BIA in that the constructs of body image "distortion," "drive for thinness," and body size "dissatisfaction" may be evaluated simultaneously.

Concurrent validity of the BITS was investigated by correlating

actual-ideal discrepancy scores, as well as the actual-feeling scores, with the EAT, Drive for Thinness, Interoceptive Awareness, Bulimia, and Interpersonal Ineffectiveness subscales of the Eating Disorder Inventory (EDI, Garner, Olmstead, & Polivy, 1983), the BULIT, and the CBS-IBS discrepancy score of the BIA procedure. A strong pattern of correlations was obtained for the actual-ideal discrepancy (.25-.70) and moderate correlations were found for the actual-feeling discrepancy scores on the BITS for the neck, shoulder, and thighs.

Attitudinal Measures

A number of scales and questionnaires have been used to assess the proposed attitudinal component of body image disturbance. These measures are virtually all self-report, paper-and-pencil measures and include the Body Cathexis Scale (Secord & Jourard, 1953), the Body Dissatisfaction Scale on the EDI (Garner, Olmstead, & Polivy, 1983), the Body Parts Satisfaction Scale (Berscheid, Walster, & Bohrnstedt, 1973), the Body Distortion Questionnaire (Fisher, 1970), the Body-Self Relations Questionnaire (Cash, Winstead, & Janada, 1986), the Body Esteem Scale (Franzoi & Sheilds, 1984), and the Body Attitude Scale (Kurtz, 1969). In a recent review, Cash and Brown (1987) concluded that all controlled studies which included an attitudinal measure reported greater body image dissatisfaction or dysphoria in clinical subjects than in controls.

Construct Issues

Although the construct of body image continues to be widely stated as an important variable in anorexia nervosa, and now bulimia nervosa, its specific meaning remains unclear. Body image has typically been conceptualized in terms of "distortion" or "dissatisfaction." Recently,

body image disturbance has also been conceptualized as being related to a "drive for thinness" or "fear of weight gain." Recent research has been aimed at identifying and separating the components of body image disturbance. The following sections review each of the proposed components of body image disturbance separately and an empirical investigation of the components utilizing the BIA procedure is presented as an illustration of how each component may be measured and interpreted.

Body Image Distortion

Body image distortion has typically been investigated as a perceptual phenomenon by having subjects indicate how they perceive their current body size. Estimates are then compared to actual body size measurements, e.g. caliper measurement, in order to determine the degree of "distortion." The greater the degree of inaccuracy in perceiving the body, the greater the degree of body image distortion. Body image distortion has been investigated via body-part size estimation and distorting image methods (for a review, see Cash & Brown, 1987) as well as using silhouettes of female body sizes, e.g., the BIA procedure (Williamson, et al., 1985) and the BITS (Schlundt & Bell, 1988).

Drive For Thinness

Drive for thinness has not yet received attention in the empirical literature as a "body image disturbance" per se. Although many researchers have investigated the phenomenon within the context of body image disturbance, they have failed to identify preference for thinness as an independent concept within the construct of body image disturbance. In other words, many investigations have included a measure of ideal body size but have not viewed the responses as a measure of body image

disturbance per se. Recently, however, Williamson and colleagues (Williamson et al., 1990) have conceptualized norm-referenced BIA-IBS scores as a measure of preference for thinness and have attempted to relate this phenomenon to body image disturbance within a multi-construct, additive model.

Body Image Dissatisfaction

Body image dissatisfaction has typically been investigated as an attitudinal phenomenon. A number of studies have utilized questionnaires as a means of measuring dissatisfaction with body size (Garner, Olmstead, Polivy, & Garfinkel, 1983; Johnson, Lewis, Love, Lewis, & Stuckey, 1984; Katzman & Wolchik, 1984; Leon, Lucas, Colligan, Ferdinande, & Kamp, 1985). More recently, however, the discrepancy between actual size estimates and ideal size estimates has been used to derive an index of body size dissatisfaction (Williamson et al., 1989). Using this type of index, a large discrepancy between perceived size and ideal size would be indicative of extreme dissatisfaction and a greater body image disturbance whereas a small discrepancy would indicate a slight dissatisfaction and less body image disturbance.

Empirical Research

In a study utilizing the BIA procedure, Williamson et al (1989) found that bulimia nervosa subjects perceived themselves as larger than same-sized normals across weight levels (from 75 pounds to 185 pounds) indicating a body image distortion at all weight levels measured (see Figure 1). Thus, across all weight levels measured in this sample, all bulimia nervosa subjects viewed themselves as larger than non-bulimic subjects of the same weight.

As shown in Figure 2, all bulimia nervosa subjects also desired to be thinner than their same-sized counterparts, indicating a strong preference for thinness at each weight level. Figure 3 includes both CBS and IBS scores for bulimia nervosa subjects and non-bulimics. The shaded area signifies the degree of body size dissatisfaction at each weight level for non-bulimics and the vertical bars signify the degree of body image dissatisfaction for bulimia nervosa subjects across weight levels. Of particular interest in this study is the finding that bulimics weighing more than 80 pounds chose an ideal figure smaller than their current figure, thus indicating body image dissatisfaction at all weight levels greater than 80 pounds. Control subjects, in contrast, chose (a) an ideal figure which was larger than their current figure when weight was below 100 pounds (as opposed to 80 pounds for bulimics), (b) an ideal size identical to current size when at a low-normal weight level, i.e., approximately 100 pounds, and (c) an ideal size smaller than their current figure when overweight, i.e., greater than 100 pounds. Thus, body image dissatisfaction was shown to be present in bulimic subjects who weighed greater than 80 pounds but only in controls who weighed greater than 100 pounds. Thus, these data suggest that bulimics are dissatisfied with their weight even when at a low weight level (80 to 100 pounds) whereas control subjects appear to be dissatisfied only at higher weight levels. Taken together, Figures 1 through 3 suggest that body image disturbance is present in bulimics even when at a low weight level and may be the result of body image distortion, drive for thinness, or both.

Theoretical Model of Body Image Disturbance

From the data obtained in the previously described study,

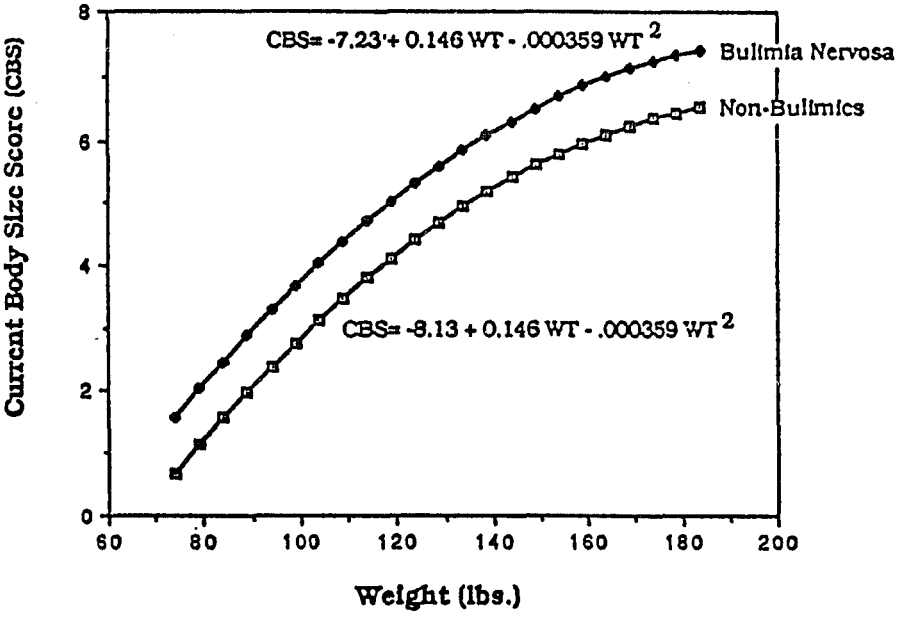

Figure 1. Current Body Size (CBS) Scores as a Function of Weight for Bulimia Nervosa and Non-Bulimic Females.

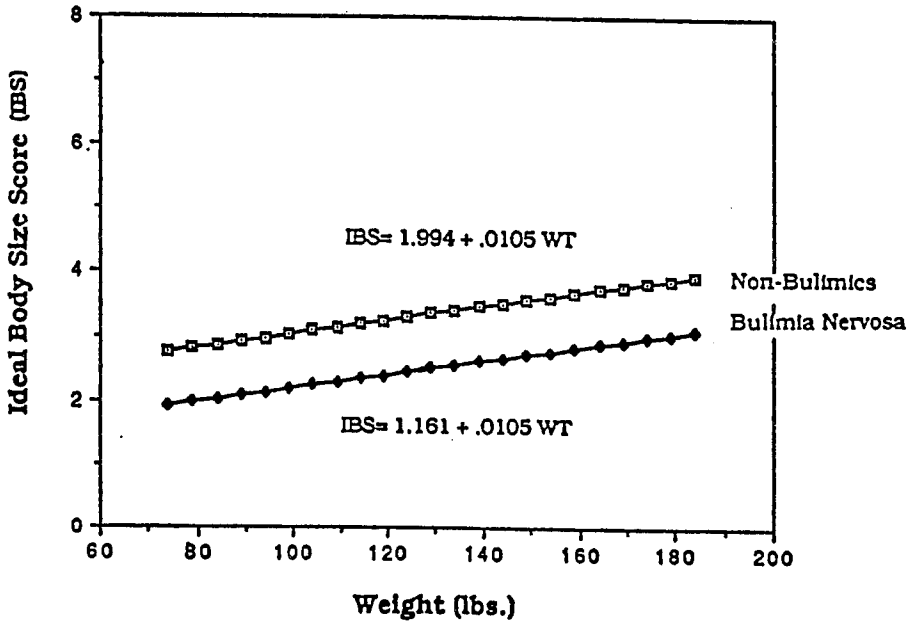

Figure 2. Ideal Body Size (IBS) Scores as a Function of Weight for Bulimia Nervosa and Non-Bulimic Females.

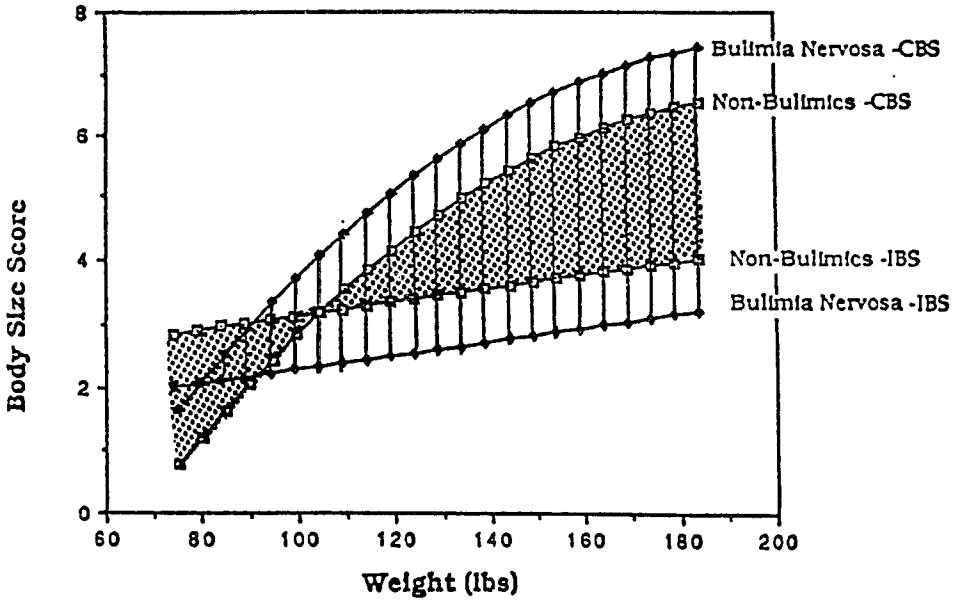

Figure 3. Current Body Size (CBS) Scores and Ideal Body Size (IBS) Scores as a Function of Weight Level for Bulimia Nervosa and Non-Bulimic Females.

Williamson et al (1990) have developed a theoretical model of body image disturbance. The model was designed to delineate the factors which may be involved in body image disturbance in an additive equation. Within the theoretical model (see Figure 4) it is proposed that body size dissatisfaction is a function of both body image distortion and drive for thinness, as measured by the individual's norm-referenced CBS and IBS, respectively. Body size dissatisfaction is dependent upon the degree of distortion, the intensity of the drive for thinness, or both. It is proposed that body image dissatisfaction is not a static phenomenon but is influenced by environmental stimuli which may affect both distortion and/or drive for thinness by activating the bulimic individual's fear of weight gain. Figure 4 illustrates this hypothesis. The left side of the figure depicts a baseline level of body image dissatisfaction typically seen in both bulimia nervosa subjects and non-bulimic females. Most non-bulimic females also exhibit body size dissatisfaction as they view themselves as larger (CBS) than they would like to be (IBS). Bulimia nervosa subjects, however, have a much greater degree of dissatisfaction as they view themselves as even larger (CBS) than non-bulimic females and desire an even smaller body size (IBS). Thus, the left side of the figure is indicative of a baseline level of body image disturbance for both bulimia nervosa subjects and non-bulimic subjects.

The right side of Figure 4 illustrates the predicted reactive effects of body image disturbance when environmental events activate the bulimic's fear of weight gain. The non-bulimic's level of body size dissatisfaction is not predicted to change as the CBS and IBS should not be affected by the environmental stimulus. The body size dissatisfaction

Theoretical Model of Body Image

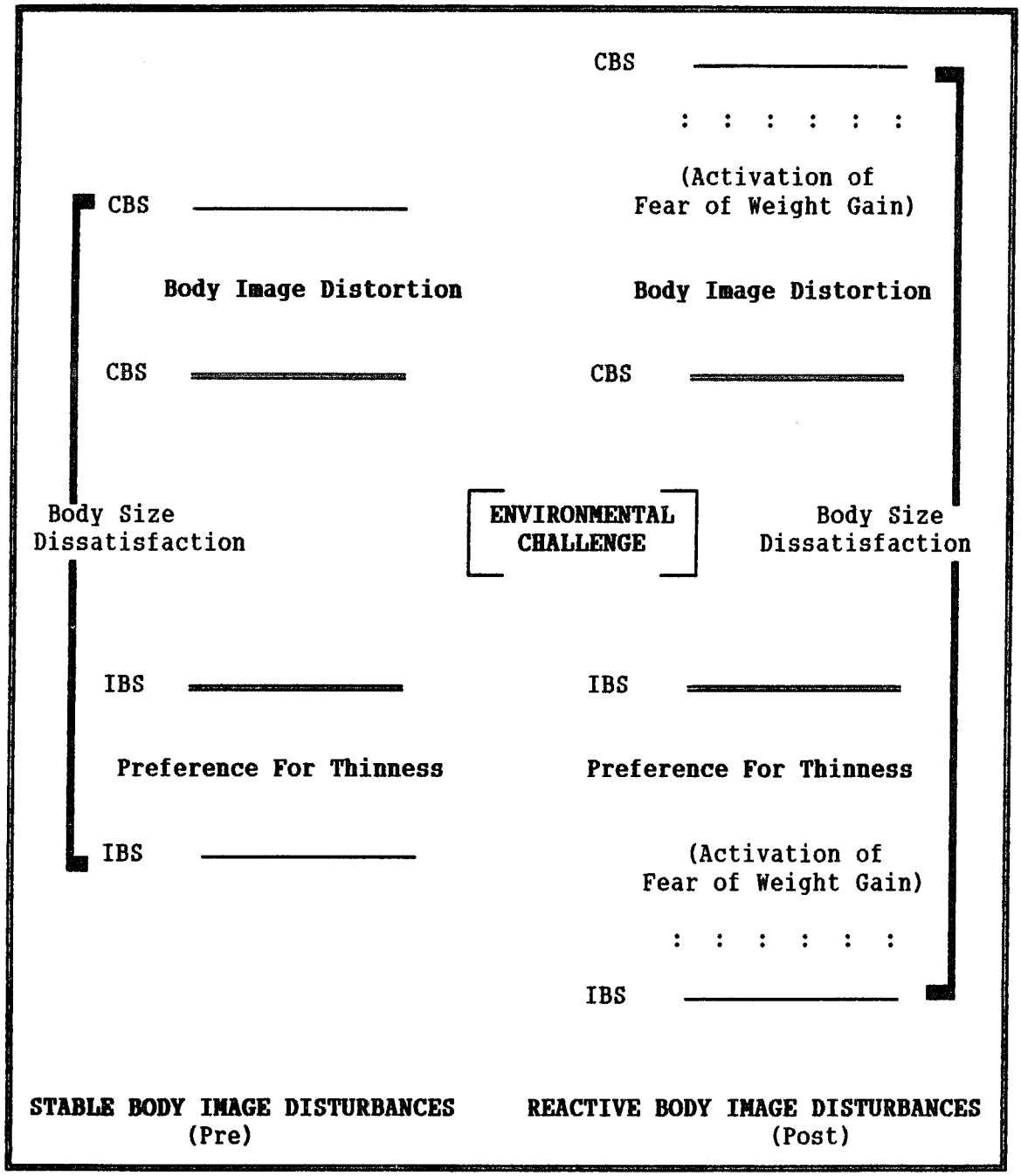

Figure 4. Theoretical Model of Body Image Disturbance in Bulimia Nervosa

of the bulimic, however, is predicted to increase as a result of an increase in body image distortion (CBS), an increase in drive for thinness (IBS), or both. Environmental challenges, such as eating or weighing, are hypothesized to activate the bulimic's fear of weight gain which, in turn, will lead to an increase in body image distortion and/or drive for thinness.

A number of experimenters have studied the effects of environmental challenges on body image distortion but none have investigated the construct in terms of body image dissatisfaction or drive for thinness. A review of the studies investigating the effects of environmental challenges on body image distortion is presented here to exemplify the experimental protocol that has been utilized in this type of research. The environmental challenges that have been investigated most frequently include consumption of a high calorie meal and mirror confrontation. Techniques used in these investigations have varied and will be specified when possible.

Environmental Challenges

The previous formulation of the construct of body image (refer to Figure 4) proposes that body image disturbance is a reactive phenomenon and is susceptible to modification by environmental challenges. Investigations of reactivity have primarily focused on changes produced by meal consumption and perceived caloric or carbohydrate content of food consumed. Mirror confrontation, weight restoration, and changes in experimental instructions have also been targeted as environmental challenges to body image disturbance. Studies investigating the effects of food consumption on body image have produced mixed results. Two

studies using distorting image techniques (Freeman et al., 1983; Garfinkel et al, 1978) reported no change in body image distortion in both anorexic and bulimic subjects following consumption of a meal, regardless of the perceived caloric content of the foodstuff. Studies utilizing body-part size estimation techniques, in contrast, have found that meal ingestion influenced estimates of body image in both anorexic and bulimic subjects. Crisp and Kalucy (1974) showed an increase in anorexics' body size estimation following consumption of a meal which was perceived as high in carbohydrates but not after a meal perceived as low in carbohydrates. Control subjects did not differ in their body size estimates following either meal. Lohr and Barrios (1988) reported an increase in overestimation in bulimic subjects who consumed 3 ounces of ice cream relative to bulimics who did not receive the food. Furthermore, these authors indicated that other groups, i.e., obese and normals, did not respond to the ice cream challenge with a change in estimation of body size.

The effects of mirror confrontation have also been investigated with regard to body image disturbance in anorexia nervosa and bulimia nervosa subjects. Norris (1984), using the BIDD (body-size estimation technique), found anorexics' overestimation to decrease significantly more than the overestimation of bulimics, neurotics, and controls following confrontation with their image in a mirror. Pierloot and Houben (1978), using the VSE task, also showed less overestimation in anorexics following mirror confrontation, although this finding failed to reach statistical significance. Neurotic subjects in this study showed a non-significant increase in overestimation. A study utilizing a distorting image

technique (DPT) reported that mirror confrontation did not alter current or ideal size estimation in anorexia nervosa subjects (Garfinkel et al., 1978).

The effects of weight restoration on body image disturbance have also been investigated. Two studies that have utilized the VSE task with anorexia nervosa subjects (Crisp & Kalucy, 1974; Slade & Russell, 1973) reported more accuracy in body size estimates following weight restoration. Another study using the VSE task with anorexics (Button et al., 1977) found that estimates were not affected by weight change although a high, positive correlation between overestimation and amount of weight gained was reported. One study which utilized the DPT (Garfinkel et al., 1979) found estimates were not affected by weight change over one year.

Reactivity to external environmental stimuli was investigated by Crisp and Kalucy (1974) by instructing the anorexic subjects to "drop their guard" after an initial estimation trial. Less overestimation was obtained after the instruction was given prior to weight restoration (65% to 40%) and after weight restoration (35% to 13%).

In summary, meal consumption has been shown to increase body image distortion in anorexics and bulimics with body-part size estimation tasks but not with distorting image techniques. Mirror confrontation has been shown to decrease body image distortion when measured with body-part size estimation tasks but not with distorting image techniques. Greater accuracy in body size estimation following weight restoration has also been shown with body-part size estimation tasks but, again, not with distorting image techniques. Thus, environmental reactivity of body image

distortion, across stimuli, appears to be evident with body-part size estimation tasks only. It is possible that distorting image techniques are of insufficient sensitivity to detect changes in body image distortion due to environmental stimuli. A study designed to investigate the reactive effects of body image disturbance in bulimia nervosa is needed to simultaneously evaluate the three components of body image proposed in the above model, i.e., body image distortion, drive for thinness, and body size dissatisfaction, using dependent measures of sufficient sensitivity to detect change.

Hypothesis and Experimental Design

Investigations of the effects of environmental challenges on body image disturbance as conceptualized in the proposed theoretical model (refer to Figure 4) are lacking. This study was designed to investigate the reactivity effects of an environmental challenge on body image disturbance in bulimia nervosa. A 2 (Group) X 2 (Phase) factorial design (Figure 5) was utilized in this study. Bulimia nervosa subjects and non-bulimic control subjects were compared on a variety of measures related to body image disturbance prior to and following the environmental challenge task. This study was the first to simultaneously evaluate the effects of an environmental challenge on several measures conceptually related to body image disturbance. The environmental challenge chosen for use in this study included height/weight measurement, consumption of a candy bar and non-diet soft drink, and an additional weight measurement. This combination of challenges was used in order to maximize the likelihood of observing the proposed reactivity effect.

Body image assessment utilized the BIA and the BITS as both are

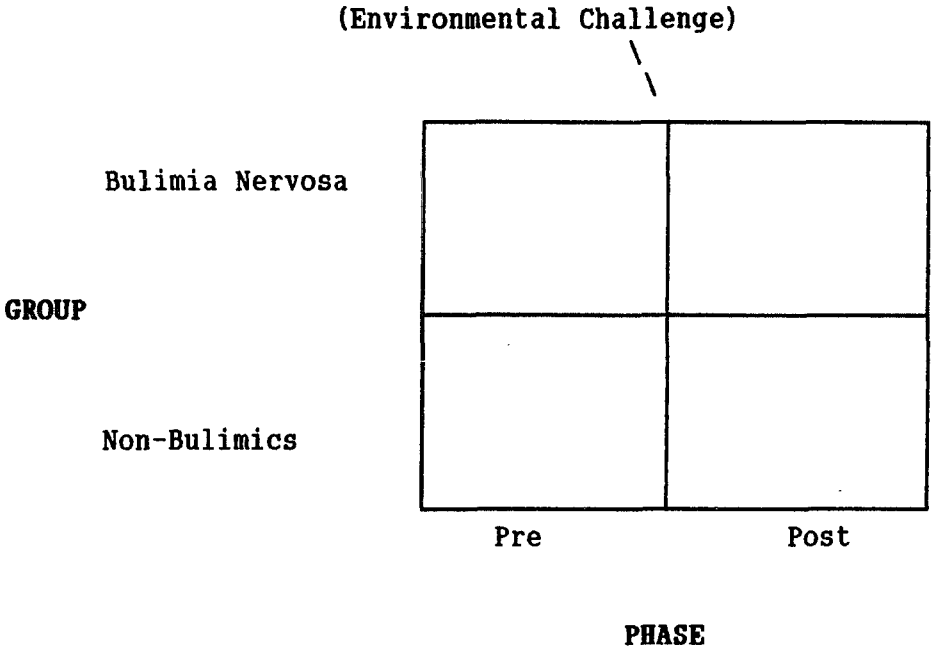

Figure 5. Experimental Design

capable of simultaneous measurement of body image distortion, drive for thinness, and body size dissatisfaction, and were useful in testing the theory presented here. In addition, the BIA is simple and time-efficient while the BITS is very sensitive to minute changes in specific body areas.

The Goldfarb Fear of Fat Scale (GFFS, Goldfarb, Dykens, & Gerrard, 1985) was used because of its ability to differentiate bulimia nervosa subjects from non-bulimic subjects in terms of fear of weight gain and to evaluate changes in fear of obesity after the environmental challenge. The GFFS was also used as a covariate to evaluate whether fear of weight gain was the "activating variable" in body image disturbance. Two subscales of the EDI (Body Dissatisfaction and Drive For Thinness Scales) were included as dependent measures because they are conceptually related to the theoretical model. Anxiety ratings (SUDS) were also obtained pre-post in order to evaluate whether subjects perceived themselves as more anxious after the environmental challenge.

It was hypothesized that body image dissatisfaction, as measured by the actual-ideal discrepancy of the BIA and the BITS, would increase in bulimia nervosa subjects, but not control subjects, following the environmental challenge. Body size dissatisfaction was hypothesized to increase as a result of an increase in body image distortion, drive for thinness, or both. In addition, it was hypothesized that fear of weight gain, as measured by the GFFS, would be intensified by the challenge (consumption of snack and weighing) and would be the moderating variable in the reactivity effect. The EDI subscales and the anxiety ratings were also predicted to differentiate groups at baseline as well as differentially change as a function of the challenge.

Method

Subjects

A total of 36 female subjects participated in this study. Eighteen subjects with a diagnosis of bulimia nervosa were selected for inclusion in the clinical sample and 18 non-bulimic, undergraduate females were screened for inclusion in the control sample. All subjects were diagnosed via a clinical interview (see Appendix A for interview protocol) and administration of the BULIT, EAT, and EQ (shown in Appendices B, C, and D, respectively). All clinical subjects were required to meet the DSM-III-R (APA, 1987) diagnostic criteria for bulimia nervosa (see Appendix E). In addition, scores greater than 102, 30, and 40 on the BULIT, EAT, and EQ, respectively, were required for diagnosis of bulimia nervosa. All clinical subjects were offered treatment for their eating disorder at the site of initial presentation, i.e., Louisiana State University Psychological Services Center or Parkland Hospital, following participation in the study.

Control subjects were screened via a clinical interview (refer to Appendix A) to rule out the presence of an eating disorder. Height and weight were measured and control subjects were matched with bulimics on height (+/- 2 inches) and weight (+/- 5 pounds) to control for body size. In addition, the absence of eating disorder pathology as measured by the BULIT, EAT, and EQ, with scores less than 88, 20, and 35, respectively, were required for inclusion in the normal sample. No subject who engaged in more than one episode of binge-eating per week and/or purged through self-induced vomiting, laxatives, diuretics, or excessive exercise was included in the control sample. An attempt was made to select control

subjects similar in age and race to those in the clinical sample. All control subjects were given the opportunity to obtain extra-credit points in an undergraduate psychology course in exchange for their participation.

Assessment Instruments

Body Image Assessment (BIA). This procedure requires the use of nine body image cards (Appendix F), each measuring 6 in. X 4 in. (15.4 cm X 10.3 cm). On each card, there is a drawing of a female figure whose body size ranges from very thin to very obese, in incremental steps. The procedure for administering the body image assessment is to place the cards in a random order on a table in front of the subject. Then the subject is given the following instructions:

> "Select the card that most accurately depicts your current body size as you perceive it to be. Please be honest. You must choose only one card and you may not rearrange the cards to directly compare them."

After the subject chooses a card, the experimenter records the card number (which is written on the back of each card) on the subject data form. Then the cards are reshuffled and again are presented in random order. The subject is then given these instructions:

> "Please select the card that most accurately depicts the body size that you would most prefer. Again, be honest and do not rearrange the cards."

Once the subject chooses a card, the experimenter records the card number. The entire procedure generally requires less than one minute. From these data, one can derive current body size and ideal body size scores for each subject. Current body size can be directly compared with norm-referenced

CBS scores (Table 1) to determine the degree of body image distortion for each subject. For example, a female weighing 125 pounds at 5'5" would fall within the normal body size cluster (refer to Table 1). If this female were to select a current body size of "4" her t-score would be "44" which is approximately one standard deviation below the mean (50), indicating a mild body size distortion, or underestimation. On the other hand, if she were to choose a current body size of "7" her t-score would be "69" which is approximately two standard deviations above the mean (50), indicating a moderate body image distortion, or overestimation. In the same manner, ideal body size is compared to norm-referenced IBS scores (refer to Table 1) to determine the intensity of the individual's drive for thinness. Using the above example, if this female were to select an ideal body size of "2" her t-score would be "35" which is one and one-half standard deviations below the mean (50), indicating a moderately strong drive for thinness. The difference between the two scores (current minus ideal) yields a body image dissatisfaction score, with a larger discrepancy indicating a greater dissatisfaction.

Body Image Testing System (BITS). This procedure requires the use of a TURBO PASCAL computer program. All instructions are provided sequentially via the computer terminal. Subjects are instructed to modify an image of a female figure for 9 independent body regions (face, neck, shoulders, chest, arms, breasts, stomach, hips, and thighs) to produce their "actual" and "ideal" body sizes. From these data, current body size and ideal body size can be derived for total body and each of the nine body parts. The discrepancy between the two, i.e., current and ideal, will yield a measure of body image dissatisfaction. Norm-referenced

Table 1

Conversion Table for Body Image Assessment (t scores)

	RAW SCORE: CBS									RAW SCORE: IBS									
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
THIN	35	43	51	59	67	75	83	91	99	28	39	50	61	72	83	94	105	116	
LOW NORMAL	27	35	43	51	59	66	74	82	89	26	37	48	59	69	80	91	102	112	
NORMAL	18	27	35	44	52	60	69	77	85	25	35	46	56	67	77	88	98	109	
HIGH NORMAL	7	17	26	35	44	53	62	71	81	21	32	43	54	66	77	88	100	111	

THIN BODY SIZE CLUSTER (N = 75)

HEIGHT RANGE = 58-67 in.; MEAN HEIGHT = 63 in.
HEIGHT RANGE = 86-109 lbs.; MEAN WEIGHT = 102 lbs.

LOW NORMAL BODY SIZE CLUSTER (N = 148)

HEIGHT RANGE = 60-70 in.; MEAN HEIGHT = 64 in.
WEIGHT RANGE = 110-123 lbs.; MEAN WEIGHT = 117 lbs.

NORMAL BODY SIZE CLUSTER (N = 133)

HEIGHT RANGE = 61-70 in.; MEAN HEIGHT = 65 in.
WEIGHT RANGE = 124-139 lbs.; MEAN WEIGHT = 130 lbs.

HIGH NORMAL BODY SIZE CLUSTER (N = 65)

HEIGHT RANGE = 63-71 in.; MEAN HEIGHT = 67 in.
WEIGHT RANGE = 140-165 lbs.; MEAN WEIGHT = 148 lbs.

scores are not yet available for use with this procedure; therefore, scores must be compared for individuals of similar body size.

Goldfarb Fear of Fat Scale (GFFS). This measure includes ten statements designed to measure a fear of weight gain, as an underlying emotional experience in eating disorder populations (see Appendix G). The scale has been shown to have very good internal consistency (coefficient alpha = .85) and has been shown to be reliable over a one-week period (r = .88). Discriminant validity has been established and correlations with other measures have indicated satisfactory concurrent validity (Goldfarb, Dykens, & Gerrard, 1985). Each subject was asked to complete this measure prior to and following the environmental challenge.

Eating Disorders Inventory (EDI). This instrument was designed to assess a number of psychological and behavioral commonalities in anorexia nervosa and bulimia nervosa. The EDI is a 64-item, self-report measure which consists of eight sub-scales measuring: 1) Drive for Thinness, 2) Bulimia symptoms, 3) Body Dissatisfaction, 4) Ineffectiveness, 5) Perfectionism, 6) Interpersonal Distrust, 7) Interoceptive Awareness, and 8) Maturity Fears. The EDI items are written in a six-point, forced choice format, with the most extreme response earning a score of 3, the immediately adjacent response 2, the next response 1, and the three choices opposite to the most "anorexic/bulimic" response receive no score (0). Only the Body Dissatisfaction and Drive for Thinness sub-scales were utilized in this study as they are conceptually related to the theoretical model. Items contained in each scale are located in Appendix H. Validity studies have reported a moderate to good level of convergent and discriminant validity (Garner, Olmstead, Polivy, & Garfinkel, 1983).

Subjective Units of Discomfort Scale (SUDS). All subjects were asked to rate their anxiety or discomfort using a 100-point scale, with the following anchors: 0 = no discomfort, 25 = minor discomfort, 50 = moderate discomfort, 75 = major discomfort, and 100 = extreme discomfort. Subjects were instructed to rate the degree of discomfort they felt at the moment they completed the rating. Anxiety ratings were obtained pre-post.

Procedure

Subjects who met the criteria for inclusion in either the clinical or control sample were asked to schedule an experimental testing session between the hours of 2:00 - 6:00 pm. All subjects were given the following information prior to participation:

> "You will be asked to complete several tasks related to body image during the session. Please eat a typical lunch at your regularly scheduled time. You should expect to be with the experimenter for approximately two hours."

Prior to beginning the experimental protocol, each subject was asked to provide information regarding 1) age, 2) history of weight fluctuations, 3) place in menstrual cycle, and 4) time/content of lunch consumed (see Appendix I for subject data form). Subjects who failed to eat lunch prior to the session were rescheduled. Informed consent was obtained following instructions (refer to Appendix J for the consent form). All subjects were debriefed following completion of the experimental session.

Environmental Challenge

The environmental challenge of fear of weight gain chosen for use in this study included height/weight measurement, consumption of a candy bar (i.e., Snickers) and non-diet soft drink (i.e., Coca-Cola), and an

additional weight measurement. This combination of tasks was used in order to maximize the likelihood of observing the proposed reactivity effect.

Each subject was required to eat at least 75% of the soft drink and 75% of the candy bar for inclusion in the study. All remaining foodstuff was weighed to determine whether this criterion had been met. Any subject who was unable to eat the designated amount was excluded from the study.

Statistical Analysis

A multivariate analysis of variance (MANOVA) was used to compare groups on all dependent measures except the discrepancy scores on the BIA and the BITS. Inclusion of the discrepancy scores in the MANOVA was inappropriate as they were mathematically derived from CBS and IBS scores. Dependent measures included CBS and IBS scores of the BIA, the overall actual body size and the overall ideal body size of the BITS, the EDI Body Dissatisfaction and Drive for Thinness scale scores, the GFFS score, and the anxiety ratings. The Hotelling-Lawley trace was used as the criterion for interpreting MANOVAs. If the initial analysis was found to be significant, each measure was analyzed separately using univariate analyses of variance (ANOVAs). Post hoc comparisons of group means were made using Scheffe's statistic.

A multivariate analysis of covariance (MANCOVA) was then conducted with the same dependent variables, with the GFFS score as the covariate, in order to evaluate the hypothesis that fear of weight gain was the critical moderating variable in this study. If the overall MANCOVA was significant, each measure was the analyzed separately using univariate analyses of covariance (ANCOVAs) with GFFS as the covariate. Again,

Scheffe's statistic was utilized for post-hoc comparisons.

A MANOVA was used to analyze the actual body size and ideal body size scores of each of the nine specific body areas assessed on the BITS. If any of the 18 dependent variables in the MANOVA were significant, univariate ANOVAs and Scheffe's post-hoc comparisons were used to compare group means. A MANCOVA was also used to analyze the actual and ideal scores of the nine body areas on the BITS, with GFFS score as the covariate. If an overall significant effect was obtained, ANCOVAs with the same dependent measures, with GFFS as the covariate, were performed. Scheffe's statistic was used for post-hoc comparisons.

An ANOVA was utilized to analyze the BIA discrepancy scores. Scheffe's statistic was used for post-hoc comparisons of group means. An ANCOVA was then conducted on the BIA discrepancy scores, with the GFFS score as the covariate, in order to evaluate the effects of fear of weight gain on the discrepancy scores. Scheffe's statistic was used for post-hoc comparisons of group means.

Lastly, a MANOVA was conducted on the discrepancy score of the BITS total body size score and each of the nine body areas assessed on the BITS. Univariate ANOVA and Scheffe's post-hoc statistic were used to evaluate significant effects. The discrepancy scores of the total body score and the nine body areas of the BITS were also evaluated with a MANCOVA, with the GFFS score as the covariate, in order to evaluate the effects of fear of weight gain. An ANCOVA, followed by Scheffe's statistic, was used to evaluate significant group differences on the discrepancy scores across the nine body areas.

Results

Preliminary analyses, using analysis of variance, were conducted to compare the groups on age, height, weight, and percent overweight. These data are summarized in Table 2. No significant differences were found between groups for any of these variables.

Significant group differences were obtained for EAT scores, $F(1,34) = 72.46$, $p < .0001$, and BULIT scores, $F(1,34) = 162.11$, $p < .0001$, with the bulimic group scoring higher on both eating disorder inventories. Means and standard deviations are shown in Table 2.

Variables hypothesized to potentially affect experimental results (i.e, menstrual regularity, presence of menses, caloric content of lunch consumed prior to experimental testing session) were also evaluated in the preliminary analyses. A significant difference was obtained for group on menstrual regularity, $F(1,34) = 4.78$, $p < .03$, but not caloric content of lunch, or presence of menses. For menstrual regularity, both groups indicated some degree of irregularity although the bulimic group reported greater inconsistency in their menstrual cycles. Means and standard deviations are shown in Table 2.

Multivariate analysis of the major dependent variables showed an overall significant effect for Group, $F(9,26) = 396.71$, $p < .0001$; Time, $F(9,26) = 6.78$, $p < .0001$; and Group x Time, $F(9,26) = 5.11$, $p < .0005$. Univariate analyses showed a significant effect for Group on all major dependent variables. Significant pre-post changes were observed for SUDS ratings, $F(1,34) = 37.02$, $p < .0001$; Drive for Thinness scores, $F(1,34) = 4.36$, $p < .04$; CBS scores, $F(1,34) = 13.26$, $p < .0009$; BIA difference scores, $F(1,34) = 5.87$, $p < .02$; and BITS rating scores, $F(1,34) = 6.55$,

Table 2

Means, standard deviations, and F values of demographic variables by group.

	MEANS (SD)		ANOVA
	BN	N	F values
AGE	21.44 (3.71)	23.00 (4.66)	F = 1.23
HEIGHT	63.52 (2.16)	63.94 (1.96)	F = 0.37
WEIGHT	126.80 (17.40)	125.83 (15.68)	F = 0.03
PERCENT OVERWEIGHT	+6.47 (11.81)	+5.35 (11.16)	F = 0.09
EAT	40.66 (15.70)	8.11 (4.07)	F = 72.46***
BULIT	114.16 (20.02)	48.11 (9.13)	F = 162.11***
MENSTRUAL REGULARITY	0.66 (0.48)	0.94 (0.23)	F = 4.78*
MENSES PRESENT	0.27 (0.46)	0.27 (0.46)	F = 0.00
CALORIES (LUNCH)	336.06 (115.30)	417.00 (143.60)	F = 2.82

* = $p < .05$
** = $p < .01$
*** = $p < .001$

$p < .01$. Significant Group x Time interactions were obtained for SUDS ratings, $F(1,34) = 31.68$, $p < .0001$; Drive for Thinness scores, $F(1,34) = 7.07$, $p < .01$; BITS total score for actual body size, $F(1,34) = 7.09$, $p < .01$; and BITS rating scores, $F(1,34) = 3.93$, $p < .05$. These data are summarized in Table 3. Standard deviations and error terms for each variable are presented in Appendix K.

Figure 6 illustrates the pattern of results obtained for the significant Group x Time interaction for SUDS ratings. This interaction is representative of the changes observed across all significant interactions. As shown in Figure 6, bulimic females reported a large increase in subjective distress following the environmental challenge whereas control subjects reported a very small increase in distress. Interactions for Drive for Thinness scores and BITS actual scores showed the same pattern of results. BITS rating scores showed the opposite pattern, which was expected, with bulimics reporting a larger decrease in overall body satisfaction following the environmental challenge.

Univariate analysis of variance of the BIA difference scores showed an overall significant effect for Group, $F(1,34) = 205.90$, $p < .0001$, with mean differences between current body size and ideal body size of +22.9 for bulimic subjects and -0.58 for non-bulimic subjects. An overall significant effect for Time, $F(1,34) = 5.87$, $p < .02$, was also obtained, indicating that the difference between current body size estimates and ideal body size estimates increased following the environmental challenge, suggesting greater mean body size dissatisfaction collapsed across groups. However, the Group x Time interaction was not statistically significant.

Multivariate analysis of the BITS nine body parts showed an overall

Table 3

Means and F values for major dependent variables by group and time.

		MEANS		GROUP	TIME	GROUP x TIME
D.V.'s		BN	N	F values	F values	F values
SUDS	pre	27.22	12.11	52.20***	37.02***	31.68***
	post	68.61	13.72			
GFFS	pre	31.94	17.16	102.53***	3.04	0.86
	post	33.22	17.55			
BD	pre	18.38	8.61	17.20***	0.89	0.32
	post	18.50	9.05			
DFT	pre	13.44	1.05	92.16***	4.36*	7.07**
	post	14.13	0.88			
CBS	pre	61.61	48.22	21.13***	13.26***	2.19
	post	67.66	50.77			
IBS	pre	41.94	49.50	5.83*	0.05	0.31
	post	41.44	50.66			
BIA DIFF	pre	19.66	-1.27	27.04***	5.87*	2.48
	post	26.22	0.11			
BITS ACTUAL	pre	93.05	81.11	11.28***	2.36	7.09**
	post	97.61	79.88			
BITS IDEAL	pre	66.11	72.88	6.72**	2.23	1.32
	post	64.00	72.61			
BITS RATING	pre	42.94	64.50	33.92***	6.55**	3.93*
	post	39.44	64.05			

* = $p < .05$
** = $p < .01$
*** = $p < .001$

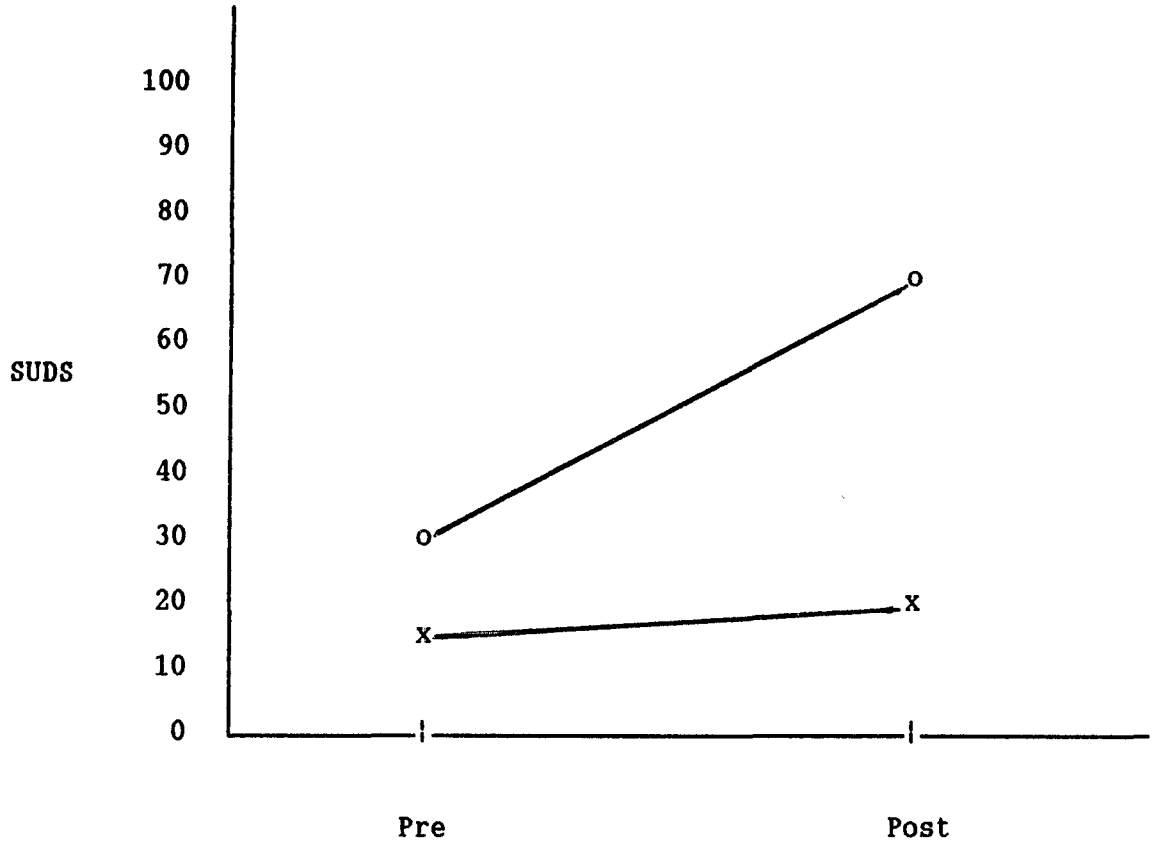

Figure 6. Subjective Units of Distress (SUDS) ratings for bulimic and non-bulimic females at pre- and post-measurement.

significant effect for Group, $F(18,17)$, 10.68, $p < .0001$, and Group x Time, $F(18,17) = 2.34$, $p < .05$. The overall effect for Time was not significant. Univariate analyses showed significant Group effects for actual body size ($p < .0003$) and ideal body size ($p < .0002$) for all nine body parts. Significant Group x Time interactions were obtained for actual stomach size, $F(1,34) = 5.71$, $p < .03$, and actual hip size, $F(1,34) = 15.11$, $p < .0004$. No significant interactions were obtained for ideal body part size.

Multivariate analysis of variance of the BITS discrepancy scores (total body size and each of the nine body parts) showed significant effects for Group, $F(10,25) = 43.54$, $p < .0001$, Time, $F(10,25) = 2.51$, $p < .03$, and Group x Time, $F(10,25) = 3.07$, $p < .01$. Univariate analyses showed significant Group effects for total body score, $F(1,34) = 335.60$, $p < .0001$, and eight of the nine body parts (except breasts). Significant main effects for Time were obtained for total body size, $F(1,34) = 5.41$, $p < .02$; stomach, $F(1,34) = 6.15$, $p < .01$; hips, $F(1,34) = 12.89$, $p < .001$; and breasts, $F(1,34) = 21.43$, $p < .0001$. Significant Group x Time interactions were obtained for total body size, $F(1,34) = 9.58$, $p < .003$; chest, $F(1,34) = 6.55$, $p < .01$; stomach, $F(1,34) = 7.44$, $p < .01$; and hips, $F(1,34) = 13.79$, $p < .0007$.

Utilizing multivariate analysis of covariance, with the GFFS score as the covariate, was proposed to investigate the effects of the variable "fear of weight gain" on the dependent variables. Preliminary correlational analyses showed that the GFFS score was highly correlated with other measures of body image disturbance in the bulimic sample but not the control sample. An analysis of variance on GFFS was performed to

test the assumption of independence of the treatment group and the covariate. A significant Group effect for GFFS, $F(1,34) = 1013.33$, $p < .0001$, was obtained, indicating that the groups differed significantly on this measure at baseline. Thus, the covariance analyses were deemed inappropriate for use in this study as the assumption of statistical independence of the covariate and the treatment was not met.

As proposed, all analyses of covariance were performed with GFFS as the covariate. Results of the analyses should be considered biased because, as described above, an assumption for the ANCOVA model was not met. However, the results obtained can be summarized to reach the conclusion that differences obtained between groups across all measures of body image disturbance were greatly reduced, although still statistically significant, by the statistical removal of the covariate.

Discussion

The hypothesis that bulimic females would exhibit greater body image disturbance than non-bulimic females prior to the environmental challenge was consistently supported across a number of body image indices. Bulimics showed greater body image disturbance than control subjects at pre-assessment on all measures of body image disturbance used in this study. As predicted in the theoretical model, bulimics chose a larger current body size, and a smaller ideal body size, on both the BIA and the BITS measures. Thus, bulimics exhibited a greater discrepancy between actual and ideal body sizes, indicating greater body size dissatisfaction. These results are consistent with previous findings which have shown body image disturbance to be a stable characteristic in bulimic females relative to control subjects (Freeman et al., 1985; Touyz, et al., 1985;

Ruff & Barrios, 1986; Willmuth et al., 1985; Williamson et al., 1985).

Menstrual regularity was the only variable hypothesized to affect experimental results that was significantly different between groups. Both groups indicated some degree of irregularity although bulimics reported more inconsistency in their menstrual cycles. Presence of menses was not significantly different across groups suggesting that, at the time of assessment, results would not be affected by changes that occur in the body during menses (e.g., water retention and bloating). Thus, the finding that the groups showed differences in menstrual regularity would not appear to affect the interpretation of group differences in body image disturbance in this study.

Analyses of the self-report measures of body image disturbance indicated a greater level of body dissatisfaction, fear of weight gain, and drive for thinness in the bulimic sample at pre-assessment. Prior to the environmental challenge, bulimic subjects reported more than twice the body image disturbance of non-bulimic females on these measures. Thus, the paper-and-pencil assessment measures of body image disturbance used in this study showed large differences between groups at baseline. Bulimics also reported greater subjective distress than control subjects, as measured by the SUDS ratings, prior to the environmental challenge. The bulimic sample may have experienced more anxiety than control subjects regarding participation in the body image study. Other interpretations, such as a greater level of anxiety in general or a greater level of general reactivity, are also plausible explanations for the higher SUDS ratings in the bulimic group at baseline.

Overall, baseline data suggest that body image disturbance is a

multi-factor and stable characteristic in bulimia nervosa subjects. Bulimics showed greater body image disturbance than non-bulimic females across all measures at pre-assessment. These data also suggest that body image disturbance may be assessed by a wide variety of measures including perceptual estimates and subjective measures of body image disturbance.

The effects of the environmental challenge on body image disturbance were limited to actual body size estimates as measured by the BITS, Drive for Thinness as measured by the EDI subscale, and ratings of overall body satisfaction as measured by the BITS. Body satisfaction, regarding specific body areas (as measured by the BITS), was also affected by the challenge and will be discussed later in this section. Finally, subjective ratings of distress (SUDS) were also affected by the environmental challenge.

Current body size estimates, as measured by the BIA, did not change differentially across groups after the environmental challenge. The difference between the BIA current body size estimates and ideal body size estimates, or body size dissatisfaction, showed the same pattern of results. However, actual body size estimates did increase after the environmental challenge in the bulimic subjects as assessed by the BITS. Thus the hypothesized increase in body size dissatisfaction following the environmental challenge was only observed when this construct was measured by the BITS. Given these data, the BITS appears to be a more sensitive measure of this phenomenon as actual or current body size estimates on the BITS increased differentially across groups after the environmental challenge. This finding is not surprising as the BITS is capable of measuring nine body areas as well as the whole body. In addition, each

of the nine body areas is measured using a minute scale, i.e., pictels on a CRT monitor. Thus, it may be more practical to utilize the BITS to detect reactivity of body image disturbance.

Bulimic's SUDS ratings increased from 27 to 68 (100-point scale), indicating a large increase in subjective distress following the environmental challenge. Control subjects did not report a greater level of distress following the environmental challenge (increase of 1.5 on 100 point scale). This finding indicates that bulimics experienced greater subjective anxiety as a result of eating a high calorie snack, and having their weight measured, than non-bulimic females.

Ratings of overall body size satisfaction (BITS) decreased after the challenge in the bulimic sample indicating that these subjects felt more negative about their bodies after the challenge. This finding was not supported by measures of body size dissatisfaction as measured by the Body Size Dissatisfaction scale of the EDI or the difference scores on the BIA. It appears that these latter measures were not sufficiently sensitive to detect changes in body size satisfaction after the environmental challenge. The subjective body satisfaction ratings of the BITS were affected by the environmental challenge, however.

Ideal body size estimates, as measured by both the BIA and the BITS, were not affected by eating and weight measurement. This finding suggests that preference for thinness is not a reactive component of body image disturbance. Neither group indicated a preference for a smaller "ideal" body size following the challenge. This effect was consistent across all perceptual measurement techniques. The paper-and-pencil measure administered to assess drive for thinness (scores on the EDI subscale)

were significantly higher in the bulimic group after the environmental challenge, although the actual increase in scores was very small (less than 1 point on a 21-point scale). Thus, the finding that drive for thinness was affected by the challenge should be considered relatively weak since other measures of this construct did not change differentially across groups as a function of time.

With respect to the theoretical model, it appears that the greater body image dissatisfaction observed in the bulimic sample, after the environmental challenge, was due to an overestimation of current body size rather than an increase in drive for thinness or greater preference for a smaller body size. However, this effect was only observed when the BITS was utilized for assessment. Given these data, the theoretical model would be revised as shown in Figure 7. The left side of the model, depicting the stable body image disturbance, was supported by data from both the BIA and the BITS and, therefore, is unchanged. The right side of the model, depicting the reactive effects of body image disturbance as measured by the BITS has been revised to indicate that bulimics chose a larger current body size, rather than a smaller ideal body size, after being weighed and consuming a high-calorie snack. Thus, the observed increase in body size dissatisfaction, compared to baseline and compared to non-bulimics, was due to an increased estimation of current or actual body size.

The hypothesis that fear of weight gain, as measured by the GFFS score, would be a critical moderating variable in the reactivity of body image disturbance was not adequately tested in this study. It is difficult to determine from these results whether fear of weight gain, or

Theoretical Model of Body Image

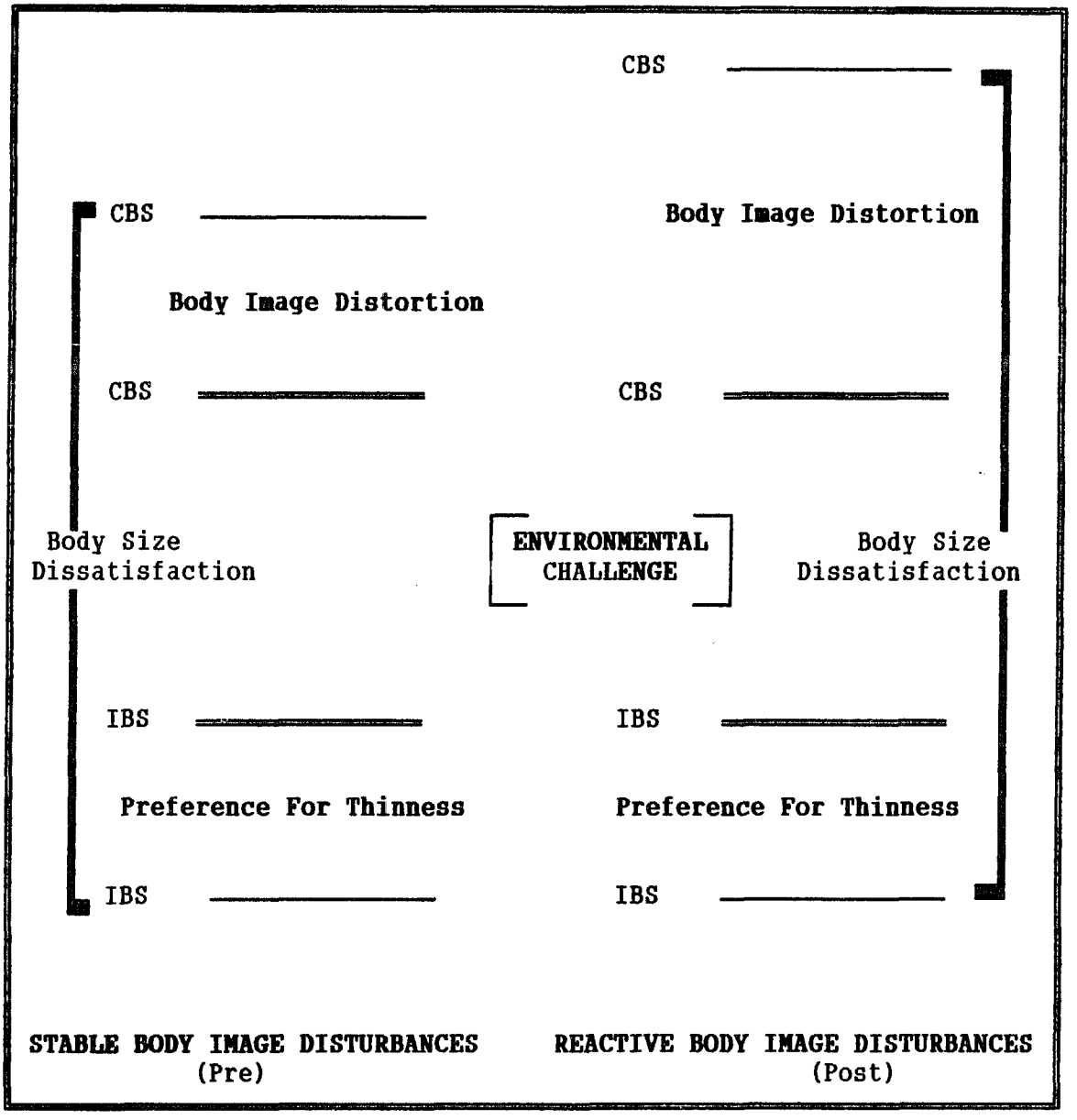

Figure 7. Revised Theoretical Model of Body Image Disturbance in Bulimia Nervosa

some other variable, influenced the increase in estimates of current body size in the bulimic sample. It is possible that the bulimic's overall level of distress was affected by the challenge and led to greater overestimation of body size. However, GFFS scores did differentiate the groups and was highly correlated with other measures of body image disturbance in the bulimic sample. Thus, fear of weight gain appears to be of some importance in these results. The exact nature of this relationship must be tested in future investigations of body image disturbance.

The BITS was utilized in this study in order to investigate the effects of the environmental challenge on estimation of specific body areas as well as total body size perception. Bulimics estimated all body areas to be larger than controls at pre-assessment suggesting that the stable body image disturbance observed in bulimics is apparent for specific body areas as well as total body size. Body areas that were affected by the environmental challenge were the stomach and hips. Bulimic subjects estimated these body areas to be significantly larger after eating and weighing suggesting that anxiety-provoking environmental events may affect the bulimics perception of the actual size of these body parts. This finding is not surprising given the frequency with which bulimics report distention in these areas following eating.

Bulimics chose smaller ideal body parts than controls at pre-assessment, indicating that the preference for thinness exhibited by bulimics was also very sensitive to individual body parts as well as total body size. Consistent with total ideal body size estimates on the BITS, ideal body part sizes were not affected by the environmental challenge.

Again, preference for thinness, with regard to total body size or individual body areas, appears to be a stable characteristic in bulimics and controls which is not reactive to environmental events such as eating and weighing.

Body dissatisfaction, as assessed via the BITS, was greater for bulimics at pre-assessment for total body size and most body parts. After the environmental challenge, discrepancies between actual and ideal body size were greater in bulimics for total body size, stomach, hips, and breasts. Thus, eating and weighing appear to have affected the bulimics's dissatisfaction with total body size as well as particular body areas. It is not surprising that body areas which are most often targeted by bulimic females for size reduction (e.g., stomach, hips, breasts) were those affected by the challenge.

These data are consistent with previous research which has shown bulimic's body-part size estimates to be affected by consumption of a meal (Crisp & Kalucy, 1974; Lohr & Barrios, 1988) and by mirror confrontation (Norris, 1984; Pierloot & Houben, 1978). The BITS is similar to traditional body-part size estimation tasks because it allows for estimation of specific body parts in addition to total body size estimation. The results of this study confirm the previous finding that bulimics overestimate current body size parts after an environmental challenge and extend the finding to indicate that only particular body parts are affected. However, total current body size estimates were also affected by the challenge. Thus, the results of this study indicate that bulimics overestimate both current total body size and specific body areas after an environmental challenge.

With regard to methodology, the results of this study indicate that the BITS is sufficiently sensitive to measure total body size disturbance as well as body-part disturbance. In addition, this measure was sensitive to changes that occurred as a result of an environmental challenge. The BIA does not appear to be a sensitive measure of the reactive effects of body image disturbance. Considering the current state of body image assessment, the results of this study provide valuable knowledge for future assessment studies. Previous investigations which have included attitudinal measures of body image disturbance have shown a greater body image dissatisfaction or dysphoria in eating disorder populations than control subjects (Cash & Brown, 1987). This study was the first to measure subjective anxiety and attitudinal measures of body image disturbance after an environmental challenge. Bulimic females reported greater subjective distress or anxiety (SUDS ratings) than non-bulimic females following the environmental challenge. The Drive for Thinness scale of the EDI increased slightly but the Body Dissatisfaction Scale was not affected by the challenge. Therefore, the results of this study suggest that bulimics have a greater level of overall anxiety or distress that is affected by environmental events. However, paper-and-pencil measures of body image disturbance may not be sensitive to the effects of such environmental events.

The environmental challenge used in this study was chosen in an effort to maximize the likelihood of observing changes in body image disturbance. It is well known that bulimia nervosa patients dislike weighing and fear eating high calorie foods when prevented from purging (Duchmann, Williamson, & Stricker, 1989; Rosen, Leitenberg, Fondacaro,

Gross, & Willmuth, 1985). The challenge used in this study combined these behaviors and may have prompted the bulimics to experience more anxiety than would have been the case with either behavior alone. Future investigations utilizing the BITS are needed to test the effects of weighing alone or eating alone to determinewhich aspect of the environmental challenge caused an increase in bulimics estimates of current body size. The environmental challenge employed in this study was chosen for use in order to maximimize the liklihood of observing reactivity effects. Other environmental events, such as mirror confrontation or trying on clothes, should also be investigated to test the hypothesis that body image disturbance is a reactive phenomena.

Treatment of body image disturbance in bulimia nervosa patients (Butters & Cash, 1987; Rosen, Saltzberg, & Srebnik, 1989) may be refined to include specific treatment of body image distortion, or perception of current body size, in response to environmental influences. From this study, it does not appear that ideal body size estimates were affected by the environmental challenge. Thus, treatment of body image disturbance may be designed to focus on changes in perception of current body size, rather than changes in preference for a small body size, that result from such environmental events as weighing and eating. However, it is clear from the bulimics pre-challenge estimates of ideal body size that body image treatments should also focus on preference for thinness even though this component of body image disturbance does not appear to be reactive.

In conclusion, it is clear that bulimics exhibit greater body image disturbance than individuals without an eating disorder. It is also apparent that body image distortion is exacerbated by environmental

events, such as eating and weighing, in bulimia nervosa subjects as measured by the BITS. Future studies should include other eating disorder groups, such as anorexics and obese patients, to determine whether the assessment measures utilized in this study are sensitive to body image disturbance in these groups and whether they exhibit reactive body image disturbance to environmental stressors.

Future research should also be aimed at testing the revised theoretical model of bulimia presented here. The results of this study suggest that body image disturbance is a multi-factor construct which may be conceptualized in terms of body image distortion, preference for thinness, and body size dissatisfaction. More research is needed before the construct of body image disturbance will be fully understood. However, this study is the first to attempt to study the reactive effects of components of body image disturbance. Future research should be designed to evaluate each component separately to more clearly define the interactions between the components and the reactivity of each to environmental stimuli.

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Appendix A

DIAGNOSTIC INTERVIEW FOR BULIMIA NERVOSA

1. Have you ever been on a diet?

   Yes _____ No _____

2. At what age did you begin to restrict your food intake due to concern over your body size?

   _____ years old

3. Over the last year, how often have you begun a diet?

   _____ number of times

4. Have you ever had an episode of eating a large amount of food in a short period of time (an eating binge)?

   Yes _____ No _____

5. How old were you when you binged for the first time?

   _____ years old

6. How characteristic are the following of your binge eating?

	Never	Rarely	Sometimes	Often	Always
Consuming a large amount of food	N	R	S	O	A
Eating very rapidly	N	R	S	O	A
Feeling out of control	N	R	S	O	A
Feeling down or annoyed afterward	N	R	S	O	A
Getting uncontrollable urges to eat	N	R	S	O	A
Binge eating in private	N	R	S	O	A

7. Within the last three months, what has been your average number of binge episodes per week?

   _____ number of binges per week

8. Have you ever vomited or spit out food after eating in order to avoid weight gain?

   Yes _____ No _____

9. How old were you when you induced vomiting for the first time?

   _____ years old

10. Have you ever used laxatives or diuretics to control your weight or "get rid of food?"

    Yes _____ No _____

11. How old were you when you first took laxatives/diuretics for weight control?

    _____ years old

12. During the entire last month, what is the average frequency that you have engaged in the following behaviors to control weight?

BINGE EATING:

Never -- 1/month -- >1/month -- 1/week -- >1/week -- 1/day -- >1/day

SELF-INDUCED VOMITING:

Never -- 1/month -- >1/month -- 1/week -- >1/week -- 1/day -- >1/day

LAXATIVE USE:

Never -- 1/month -- >1/month -- 1/week -- >1/week -- 1/day -- >1/day

USE OF DIET PILLS:

Never -- 1/month -- >1/month -- 1/week -- >1/week -- 1/day -- >1/day

USE OF ENEMAS:

Never -- 1/month -- >1/month -- 1/week -- >1/week -- 1/day -- >1/day

EXERCISE:

Never -- 1/month -- >1/month -- 1/week -- >1/week -- 1/day -- >1/day

FASTING:

Never -- 1/month -- >1/month -- 1/week -- >1/week -- 1/day -- >1/day

13. **How many minutes a day do you currently exercise (including going on walks, riding a bicycle, etc.)?**

_____ minutes

14. **WEIGHT HISTORY:**

Current Weight _____ lbs.

Current Height _____ inches

Desired Weight _____ lbs.

Adult Years:

Highest adult weight since age 18 _____ lbs. _____ age

Lowest adult weight since age 18 _____ lbs. _____ age

How long did you remain at your lowest adult weight?

_____ days _____ months _____ years

Adolescent Years:

Highest weight between ages 12 - 18 _____ lbs. _____ age

Lowest weight between ages 12 - 18 _____ lbs. _____ age

15. How did you perceive your weight as a child between ages 6 - 12?

Very thin-Somewhat thin-Normal-Somewhat overweight-Very overweight

16. At your current weight do you feel that you are:

Very thin-Somewhat thin-Normal-Somewhat overweight-Very overweight

17. **How much does a <u>two</u> pound weight <u>gain</u> affect your feelings about yourself?**

Extremely - Very much - Moderately - Slightly - Not at all

How much does a <u>two</u> pound weight <u>loss</u> affect your feelings about yourself?

Extremely - Very much - Moderately - Slightly - Not at all

18. How much does a <u>five</u> pound weight <u>gain</u> affect your feelings about yourself?

Extremely - Very much - Moderately - Slightly - Not at all

How much does a <u>five</u> pound weight <u>loss</u> affect your feelings about yourself?

Extremely - Very much - Moderately - Slightly - Not at all

19. Has there ever been a time when your feelings about yourself, or your social life, have changes substantially as a result of losing weight?

Yes _____ No _____

If yes, please explain.

20. How often do you weigh yourself?

More than daily _____ Daily _____ More than weekly _____

Weekly _____ Monthly _____ Less than monthly _____

21. How dissatisfied are you with the way your body is proportioned?

Extremely - Very much - Moderately - Slightly - Not at all

22. How often do you think about your body shape?

Always - Often - Sometimes - Rarely - Never

23. How do you feel about the different areas of your body?

FACE: Strongly positive - Moderately positive - Neutral
Moderately Negative - Strongly negative

ARMS: Strongly positive - Moderately positive - Neutral
Moderately Negative - Strongly negative

SHOULDERS: Strongly positive - Moderately positive - Neutral
Moderately Negative - Strongly negative

BREASTS: Strongly positive - Moderately positive - Neutral
Moderately Negative - Strongly negative

STOMACH: Strongly positive - Moderately positive - Neutral
Moderately Negative - Strongly negative

BUTTOCKS: Strongly positive - Moderately positive - Neutral
Moderately Negative - Strongly negative

THIGHS: Strongly positive - Moderately positive - Neutral
Moderately Negative - Strongly negative

Appendix D

EATING QUESTIONNAIRE

Directions: In the space provided, indicate the letter of the answer that best describes your eating behavior.

___ 1. How often do you binge eat? (a) seldom; (b) once or twice a month; (c) once a week; (d) almost every day; (e) everyday.

___ 2. What is the average length of a binging episode? (a) less than 15 minutes; (b) 15-30 minutes; (c) 30 minutes to one hour; (d) one hour to two hours; (e) more than two hours. Please indicate length of episode _____.

___ 3. Which of the following statements best applies to your binge eating? (a) I don't eat enough to satisfy me; (b) I eat until I've had enough to satisfy me; (c) I eat until my stomach feels full; (d) I eat until my stomach is painfully full; (e) I eat until I can't eat anymore.

___ 4. Do you ever vomit after a binge? (a) never; (b) about 25% of the time; (c) about 50% of the time; (d) about 75% of the time; (e) about 100% of the time.

___ 5. Which of the following best applies to your eating behavior when binge eating? (a) I eat much more slowly than usual; (b) I eat somewhat more slowly than usual; (c) I eat at about the same speed as I usually do; (d) I eat somewhat faster than usual; (e) I eat very rapidly.

___ 6. How much are you concerned about your binge eating? (a) not bothered at all; (b) bothers me a little; (c) moderately concerned; (d) a major concern; (e) the most important concern in my life.

___ 7. Which best describes the control you feel over your eating during a binge? (a) never in control; (b) in control about 25% of the time; (c) in control about 50% of the time; (d) in control about 75% of the time; (e) always in control.

___ 8. Which of the following describes your feelings immediately after a binge? (a) I feel very good; (b) I feel good; (c) I feel fairly neutral, not too nervous or uncomfortable; (d) I am moderately nervous and/or uncomfortable; (e) I am very nervous and/or uncomfortable.

___ 9. Which most accurately describes your mood immediately after a binge? (a) very happy; (b) moderately happy; (c) neutral; (d) moderately depressed; (e) very depressed.

___ 10. Which of the following best describes the situation in which you typically binge? (a) always completely alone; (b) alone but around unknown others (e.g., restaurant); (c) only around others who know about my binging; (d) only around friends and family; (e) in any situation.

___ 11. Which of the following best describes any weight changes you have experienced in the last year? (a) 0-5 lbs; (b) 5-10 lbs; (c) 10-20 lbs; (d) 20-30 lbs; (e) more than 30 lbs.

___ 12. On a day that you binge, how many binge episodes typically occur during that day (a) 0; (b) 1; (c) 2; (d) 3; (e) 4 or more.

___ 13. How often do you use restrictive diets/fasts (a) never; (b) 1 time per month; (c) 2 times per month; (d) 1 time per week; (e) almost always.

___ 14. How often do you use laxatives to lose weight? (a) never; (b) 1-3 times per month; (c) 1 time per week; (d) 1 time per day; (e) more than 1 time per day. Please indicate frequency _____.

___ 15. How often do you use diuretics to lose weight? (a) never; (b) 1-3 times per month; (c) 1 time per week; (d) 1 time per day; (e) more than 1 time per day. Please indicate frequency _____.

Appendix E

DSM-III-R DIAGNOSTIC CRITERIA FOR BULIMIA NERVOSA

A. Recurrent episodes of binge eating (rapid consumption of a large quantity of food in a discrete period of time).

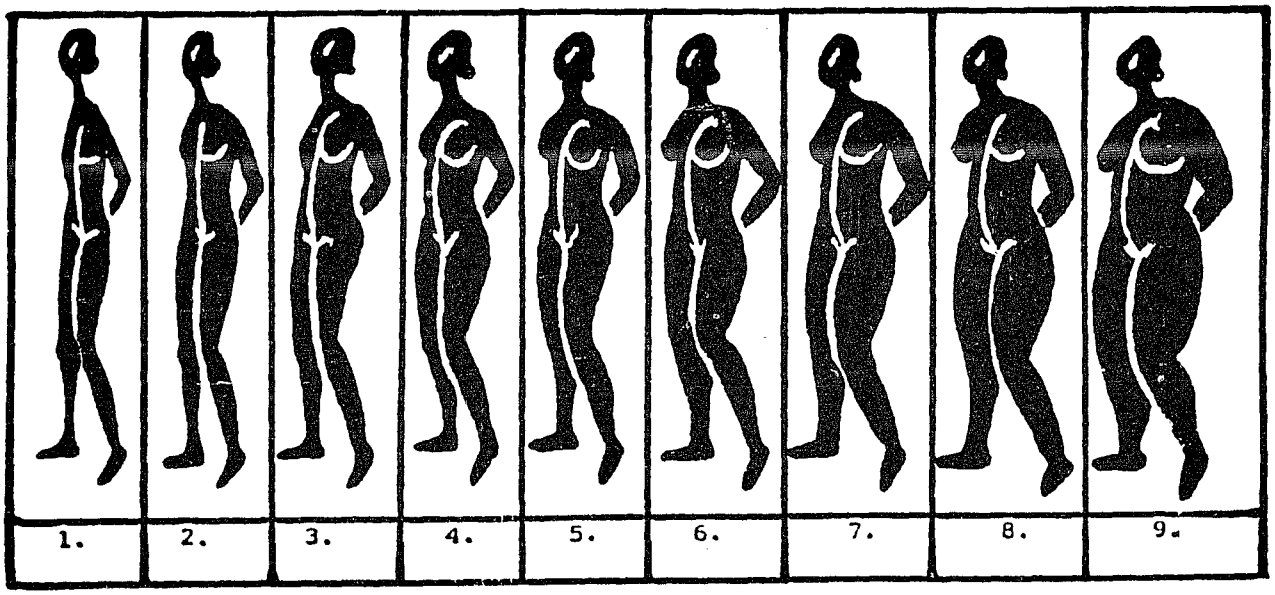
B. A feeling of lack of control over eating behavior during the eating binges.

C. The person regularly engages in either self-induced vomiting, use of laxatives or diuretics, strict dieting or fasting, or vigorous exercise in order to prevent weight gain.

D. A minimum average of two binge eating episodes a week for at least three months.

E. Persistent overconcern with body shape and weight.

Appendix F



Body Image Assessment Silhouettes

Appendix G

GFFS

Please read each of the following statements and select the number which best represents your feelings and beliefs.

1 = Very untrue
2 = Somewhat untrue
3 = Somewhat true
4 = Very true

_____ 1. My biggest fear is becoming fat.

_____ 2. I am afraid to gain even a little weight.

_____ 3. I believe there is a real risk that I will become overweight someday.

_____ 4. I don't understand how overweight people can live with themselves.

_____ 5. Becoming fat would be the worst thing that could happen to me.

_____ 6. If I stopped concentrating on controlling my weight, chances are I would become fat.

_____ 7. There is nothing that I can do to make the thought off gaining weight less painful and frightening.

_____ 8. I feel like all my energy goes into controlling my weight.

_____ 9. If I eat even a little, I may lose control and not stop eating.

_____ 10. Staying hungry is the only way I can guard against losing control and becoming fat.

Pre/Post

Appendix H

Eating Disorders Inventory: Subscale items

Item Number	Items on DRIVE FOR THINNESS Subscale
1.	I eat sweets and carbohydrates without feeling nervous.
7.	I think about dieting.
11.	I feel extremely guilty after overeating.
16.	I am terrified of gaining weight.
25.	I exaggerate or magnify the importance of weight.
32.	I am preoccupied with the desire to be thinner.
49.	If I gain a pound, I worry that I will keep gaining.

Item Number	Items on BODY DISSATISFACTION Subscale
2.	I think that my stomach is too big.
9.	I think that my thighs are too large.
12.	I think that my stomach is just the right size.
19.	I feel satisfied with the shape of my body.
31.	I like the shape of my buttocks.
45.	I think my hips are too big.
55.	I think my thighs are just the right size.
59.	I think my buttocks are just too large.
62.	I think that my hips are just the right size.

Appendix I

Subject Information

Subject Number/Initials: _____ Date: _____
Age: _____ Time: _____
Height: _____ Weight: _____

Weight History: Highest weight _____lbs. at age _____
Lowest weight _____lbs. at age _____

Menstrual History/Status:
Regular menstrual cycle? _____Yes _____No
Currently menstruating? _____Yes _____No
Date of last menses? _____

Food consumption:
Eaten lunch today? _____Yes _____No
Content of lunch? _____
_____
Time lunch eaten? _____a.m./p.m.

Subject Data

Baseline EQ_____ EAT_____ BULIT_____

SUDS RATINGS Pre _____ Post _____

BIA DATA:

Pre: Current: _____ T = _____; Ideal: _____ T = _____

Post: Current: _____ T = _____; Ideal: _____ T = _____

BITS DATA: attach computer print-out

GFFS DATA: Pre _____ Post _____

EDI DATA: Body Dissatisfaction Scale Drive for Thinness Scale

Pre _____ Post _____ Pre _____ Post _____

FOOD CONSUMED DURING THE EXPERIMENT:

Candy Bar _____% eaten; _____grams remaining

Soft-Drink_____% drank; _____ounces remaining

Appendix J

Experimental Consent Form

I, _____, voluntarily consent to participate in the eating Disorders Research program directed by Donald A.Williamson, Ph.D. This research involves both normal and eating disordered individuals. Therefore, provision of my consent does not imply that I have problems related to eating. By my signature, I agree to participate in a body image study which involves height/weight measurement and consumption of a snack. I allow data pertaining to me to be reported in scholarly publications, scholarly meetings, or in educational programs related to the Eating Disorders Research project. I understand that my identity will remain anonymous and that my name will not be used in any publications or presentations which are derived from this research.

All of my questions have been answered and I understand that I may withdraw from the research project without penalty at any time.

_____/_____
Signature Date

_____/_____
Witness Date

Appendix K

Standard Deviations and Mean Square Error Terms for Major Dependent Variables.

D.V.'s		Standard Deviations		Mean Square Error Terms	
		(BN)	(N)	Group	Time Group x Time
SUDS	pre	20.87	11.51	422.43	224.77
	post	19.15	18.94		
GFFS	pre	4.30	5.19	40.68	4.11
	post	7.76	4.94		
BD	pre	7.76	6.14	96.67	1.56
	post	7.59	6.37		
DFT	pre	6.27	1.25	33.86	1.54
	post	5.32	1.18		
CBS	pre	10.62	10.76	195.20	25.16
	post	9.03	11.42		
IBS	pre	12.72	8.56	217.42	40.92
	post	12.33	11.36		
BIA DIFF	pre	17.57	11.12	368.50	48.39
	post	16.62	11.16		
BITS ACTUAL	pre	14.78	10.18	351.05	21.19
	post	17.78	10.29		
BITS IDEAL	pre	9.62	6.40	158.56	11.49
	post	12.87	6.37		
BITS RATING	pre	12.20	10.45	282.74	10.69
	post	14.67	10.64		

Appendix L

Vita

Sandra Jean McKenzie was born in Pittsburgh, Pennsylvania. She graduated from the University of Pittsburgh in 1983 with a Psychology major and a minor in English Composition. A Master of Arts degree was conferred from Louisiana State University in 1985. Sandra completed her clinical internship at Western Psychiatric Institute and Clinic, University of Pittsburgh's School of Medicine, in 1989. A Doctor of Philosophy Degree in Psychology will be awarded from Louisiana State University in May, 1990. She has published a number of scholarly papers in the areas of psychophysiology and eating disorders in scientific journals. Sandra is currently employed at Western Psychiatric Institute and Clinic, University of Pittsburgh's School of Medicine, as a Senior Clinician. She is currently involved in a large scale research program for childhood obesity.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Sandra Jean McKenzie

Major Field: Psychology

Title of Dissertation: An Environmental Challenge of Body Image Disturbance In Bulimia Nervosa

Approved:

Donald A. Williamson
Major Professor and Chairman

F. Glen Hanby
Dean of the Graduate School

EXAMINING COMMITTEE:

Date of Examination:

March 23, 1990